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EMPHYEMA.

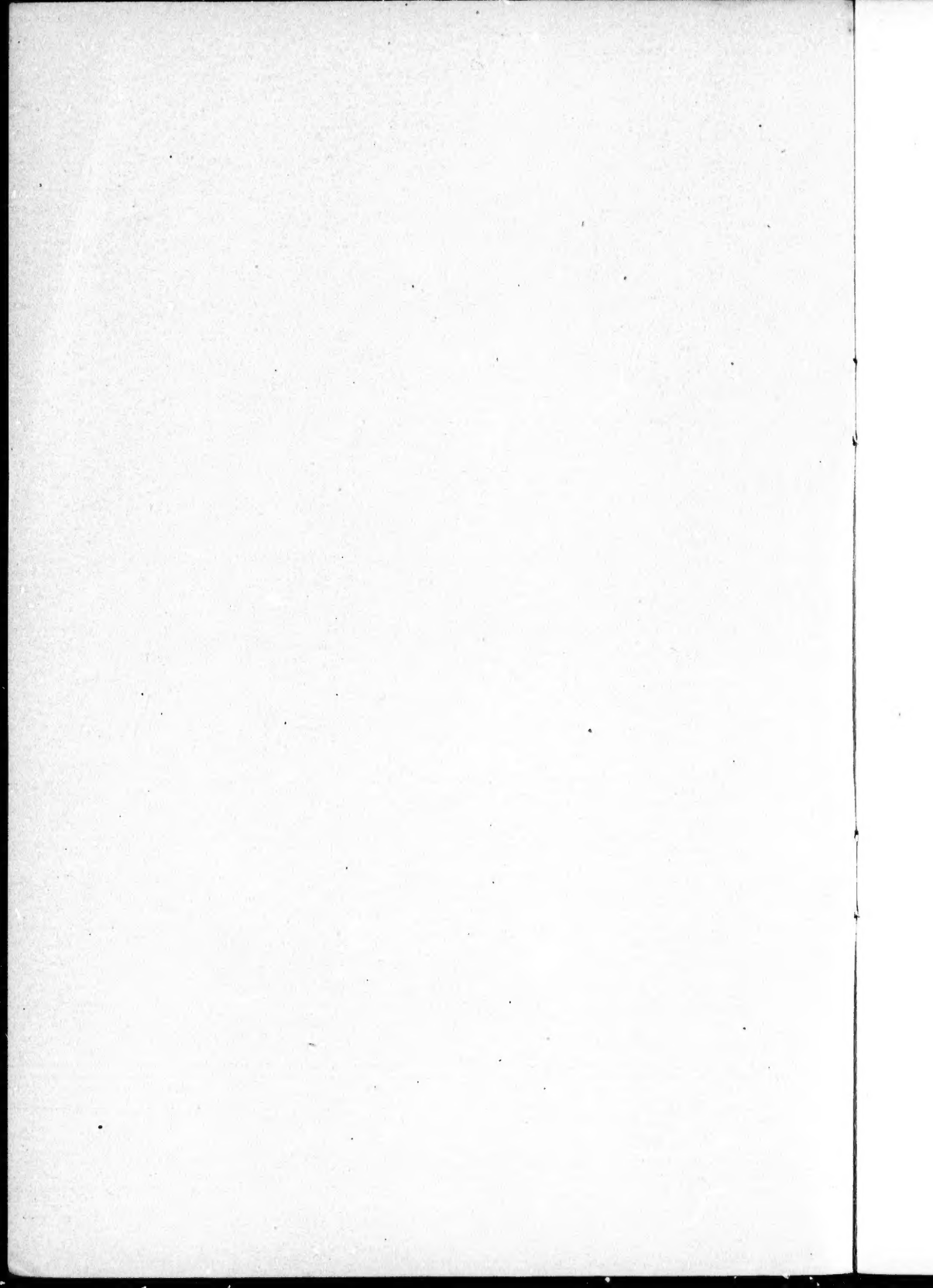
A STUDY OF THIRTY CASES FROM CLINICAL AND BACTERIOLOGICAL
STANDPOINTS.

BY

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Lecturer in Clinical Medicine, McGill University ; Assistant Physician to the Royal
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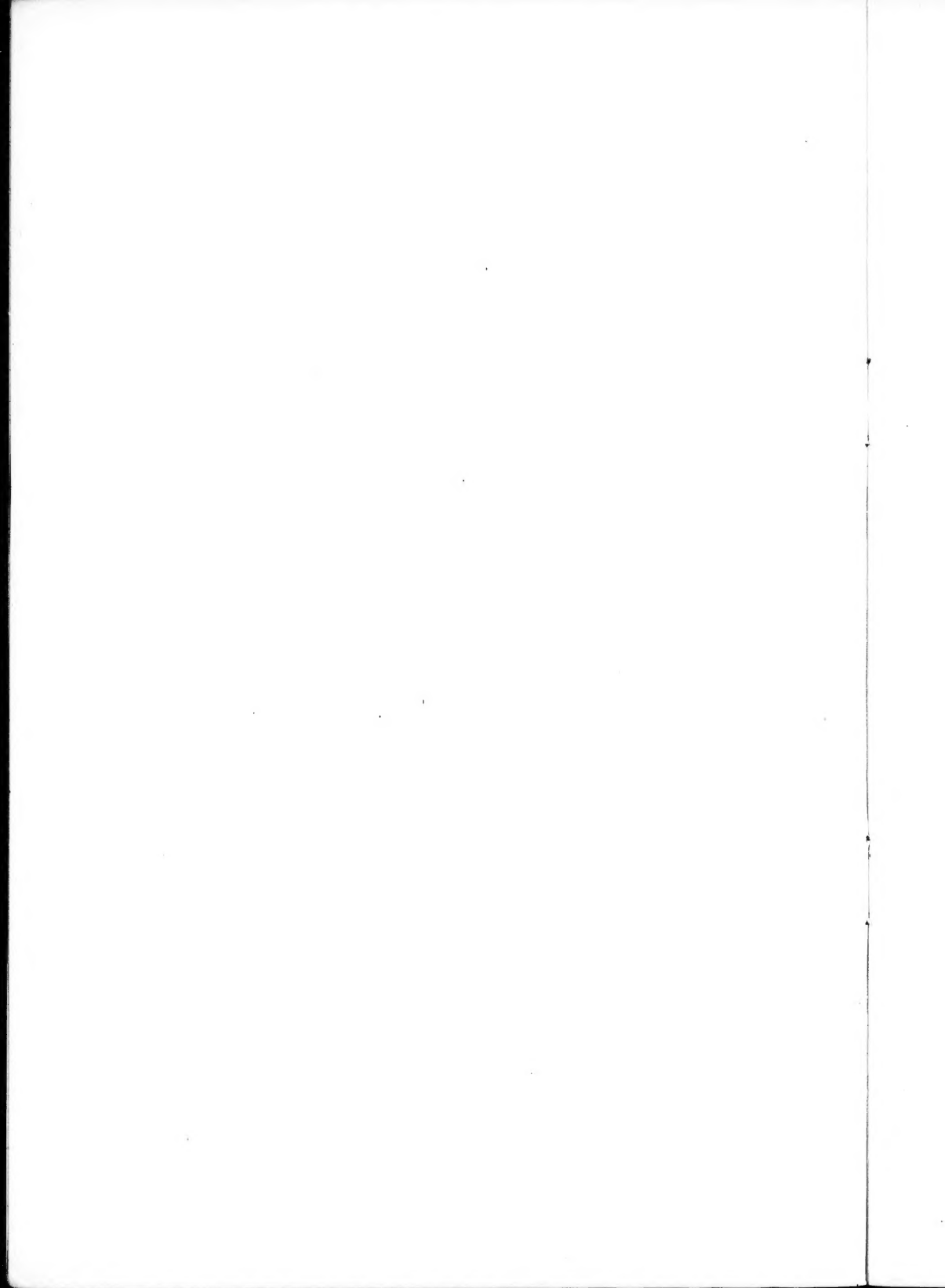
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Concerning the mode of onset of the illness in these cases, but little is noted that may be regarded as extraordinary. In those that have been classified under the metapneumonic group, an onset, best described as "pneumonic," prevailed; in some, a crisis occurred, in others none is recorded. (It should be noted at this point that not a few of these patients were not brought to the hospital until many days after the period of crisis, if such there were, had passed, and thus this part of the history is lacking).

A gradual onset was noted in four cases, three of which were those of tuberculous patients. Pleurisy, with a clear sero-fibrinous effusion, was demonstrated in another case. Severe, recurrent chills with peri-urethral abscess, marked the onset of a protracted case. Two are supposed to have followed typhoid fever, yet there is but scant support forthcoming for this supposition. The abdomen was the seat of pain so far as the complaints of four children indicated. An onset with a convulsion is not recorded.

In a general hospital, where patients with the infectious diseases were not received, one would scarcely expect to find that more than 4 per cent. of any one class of cases under treatment, were among children; especially would this be rather a surprise where the proportion of beds for children is to those for adults as 1 to 8; yet this is about the proportion we find in our hospital experience. Of the thirty patients herein reported, thirteen were under twelve years of age. The youngest of the series was eight and one-half months, the eldest sixty-six years.

Under 1 year	1
From 1 to 5 years	3
" 5 to 12 years	10
" 12 to 20 years	2
" 20 to 30 years	7
Over 30	7

There were sixteen males and fourteen females.

* Read before the Canadian Medical Association, Ottawa, September, 1900.

The right side was involved in eleven cases ; the left side in eighteen, while a double empyema was observed but once. Although no reference is made to this subject in text-books, as Dr. Francis Huber said over ten years ago, he collected from the literature about one dozen cases, and several more have been recorded since. Many of such cases have been cured, yet the one in this series terminated fatally.

Two of our patients showed scars of a former operation for empyema over the side again acutely involved. A brief report of these cases may be of interest :—

A. O. (2577), m., æt. 10 years, became suddenly ill on Jan., 25th, with sharp pain in the left side, chill, flushes, cough and dyspnoea ; fever 100° to 102°, pulse 100 to 104, respirations 36 to 40. Within a few days there were signs of fluid in his chest and the exploring needle confirmed these signs. His mother gave a history of his having pneumonia at the age of seven, and that during this illness his side was opened for pus, and the scar upon the left side confirmed that statement.

He was again operated upon along the line of the old incision, and considerable pus was evacuated but no fibrinous masses.

The recovery of this case was long and tedious, a sinus presenting after 118 days in the hospital. The second report of empyema concerns:

E. B., m. æt. 9 years, who fell ill on Sept. 20th, 1896, with chill, severe pain in right side, shortness of breath and headache, but signs of pneumonia did not develop for some ten days. After this the pain in the right axilla became more severe, a friction rub was heard, while blowing breathing and rusty sputa were the chief signs of pneumonia. In a few days the blowing breathing had disappeared and the patient's condition was constantly becoming worse. The right side, always flatter than the left, since his former operation at the age of three years, now began to show a small area of bulging over the lower ribs anteriorly, and later, œdema developed just about the scar from the former surgical wound.

He was operated upon in the usual way and made a good recovery.

Well recognised among clinicians and often referred to in books, is that form of empyema in which the cavity, once evacuated, may refill, yet this form of recurrent empyema, so far as the writer knows, is very rarely described.

Two cases in tuberculous patients, began with pneumothorax. Gas in variable quantity was noted at time of aspiration or resection in three other cases which lack the usual history of the onset of pneumothorax, as well as any further evidence of its presence.

Streptococci and staphylococci were found alone in cultures from the effusions of these cases, in two of which the odour of the pus is reported as offensive. There is no evidence to show that a communication with a bronchus existed.

<i>The Season:</i> —Winter	11	Summer	9
Spring	7	September	3

The Diagnosis:—While the history and physical signs pointed in

most instances to the presence of pus in the pleura, an exploratory aspiration was made in twenty-five cases. In one of the patients empyema was indicated by cedema and redness about a prominent area at one part of a dull half of the thorax. Four patients were admitted for conditions as follows :

1. (774) Discharging sinus having been operated on some months before.
2. (1150) Discharging sinus along the track of the aspirating needle used some weeks before.
3. (1526) Persistent sinus from operation two years previously.
4. (4348) Persistent sinus following aspiration six months before.

It is the teaching of all clinicians that when there is the least doubt about the quality of fluid in the chest, or even about the presence of fluid that one should aspirate. But little, if any, harm can come of this operation, and the diagnosis is made thereby very sure. Empyema cannot be diagnosed in season without resort to this means.

The Prognosis:—The experience derived from these cases would lead one to say that very much depends upon the nature of the infection. This we think should be first as we believe it is, of the greatest importance. In the second place, the readiness or otherwise with which the compressed or retracted lung returns to fill the cavity, marks the difference between a case of favorable and rapid progress to complete healing, and a protracted one, ending possibly in extensive rib resection with deformity.

The prognosis of purulent effusion in a tuberculous patient, usually a mixed infection, whether with or without pneumothorax, is very bad; it has been in these cases but a question of time, the discharge never ceasing. A pneumococcic infection, while comparatively benign, must be regarded in the light of the variability or the virulence of the micro-organism. Osw. Vierordt has recently reported four cases of pneumococcic empyema which had a fatal termination, in two of which peritonitis due to the same organism was present.

While the first condition of prognosis relates to the patient's life, the second condition has to do more with health of the subject and the length of time of his return thereto. Of those patients who lived and were under observation until healing was complete, that patient of whom it is recorded that "the lung expanded with a fit of coughing just as the tube was being inserted" at the time of operation, made the shortest recovery. She went out of the hospital in twenty days from date of operation, healed. Where the lung was found far from the wall of the thorax and adherent, recovery was slow, forty, fifty, sixty, seventy, and

in one case one hundred and twenty days, were spent before healing was satisfactory.

TABLE SHOWING DURATION OF ILLNESS IN RELATION TO OPERATION.

(Not including those dead or who went out before recovery.)

Hist. No.	No. of days before operation.	Date operation.	No. days after Operation.
892	20	Aug. 10th, 1895.	29
1102	48	Jan. 18th, 1896.	22
1556	46	July 30th, 1896.	72
1557	28		52
1691	20	Oct. 25th, 1896.	47 Recurrent empyema.
2084	21	May 27th, 1897.	120 Pregnant, large pleur. cav., healed.
2156	14-16	June, 1897.	225 Sinus slow in closing.
2265	20	Aug. 30th, 1897.	20
2577	10	Feb., 1898.	118 Recurrent empyema.
3475	29	April 13th, 1895.	21 Went home with tube still in.
3575	26	May 25th, 1899.	40
3602	37	June 8th, 1899.	34
3707	13	July 17th, 1899.	30
4158	15	Jan. 2nd, 1900.	70 Small sinus soon closed.
4339	22	Feb. 19th, 1900.	71 Small sinus.
4348	539	Feb. 26th, 1900.	77 Empyema necessitating extensive [resection]
4412	37	Mar. 20th, 1900.	74
4661	20	June 15th, 1900.	48

The Treatment:—There is no case of empyema recorded in this series in which cure followed a simple aspiration. It is interesting to note, however, that in one patient (1150) the pleura was aspirated, more for a diagnosis than otherwise, after the patient had been ill for about three months. The wound made by the exploring needle did not close. Pus continued to discharge through this track for about five weeks in such quantities that the dressing needed to be changed from four to five times daily. Shortly after the cessation of this flow the cough became worse and pus was expectorated in large (cupful) quantities. When admitted to the hospital the dull area on the right side was explored under ether, with small and large needles, in the eighth and tenth spaces, without finding pus. She made an uneventful recovery.

In another patient (3475) in whose history, personal and family, there appears no evidence of tuberculosis, and in whose pleural fluid pneumococci and also streptococci were found, the aspiration method had a fair trial. He was aspirated on March 26th, April 6th and 11th, and on April 13th he was operated on, a portion of the 9th rib being resected; at time of operation, the lung could not be felt. He made a rather protracted recovery.

Having but little faith in the curative effect of but simple aspiration, the pleural effusion in these cases, not admitted for closure of sinuses, etc., was evacuated by rib resection and opening the sac.

In fourteen cases a portion of the 8th rib was excised, usually at the

lower scapular angle or a little anterior thereto; in eight cases the 9th rib; in one the 7th and 8th; in one the 8th and 9th; and in one the 9th and 10th. In two cases no rib was excised, as in one of these the pus pointed and was evacuated by incision only when the patient was *in extremis*; the other is (1150) already described. A rubber drainage tube was used with but two exceptions, when a silver tube was inserted. Washing out of the cavity was adopted a few times in one case only. It was a tuberculous case, originating as a pneumothorax, in which the odor was very offensive. No untoward effects followed this process.

A solution of cocaine was used in one case of rib resection; all other cases were operated on under general anaesthesia, induced by ether or chloroform.

Fatal Cases.—Four patients died in the hospital and a fifth died a few months after going home.* The percentage of deaths, then, in these cases, so far, may be put down as 16. Of these five, *two* were tuberculous, the sinus resulting from the operation never healed. The patients were the subjects of well marked phthisis. *One* was the victim of a double empyema due it would seem to a streptococcus infection, and *one*, an old patient aged 66 years, succumbed shortly after an incision was made into the pleural sac which contained foul smelling gas and pus. Then case of F. N., No. 3571, where appendicitis and peritonitis complicated the empyemic condition, completes the number.

Considering the gravity of those cases we think the results may be put down as very good indeed. Where a simple infection with the pneumococcus was found, no deaths are recorded.

1. (3632). C. A., æt. 66, m., was taken ill May 1st, 1890, with pain in lower part of right thorax. He remained at work till May 24th, when he took to bed. Dulness, diminished breathing and swelling from 7th rib downward on right side, were the chief signs made out; heart dulness could not be distinguished. June 15th, incision made over swelling near right costal margin, foul smelling gas escaped and limits of the cavity were not ascertained. A rubber drain was inserted when pus flowed on coughing only.

On 17th, 18th and 20th, attempts were made to localize the pus, punctures being made in 8th and 9th spaces but without result. Patient died 20th June, 1.45 p.m. (No note of bacteriological examination; post-mortem and cultures, not made.)

The clinical history in this case is obscure, the finding suggests rather a latent localized pyopneumothorax.

2. (3571). F. N., æt. 37. (See chief facts in this case under Bacteriology.)

3. (1855). A. L., æt. 29. In August, 1890, patient suffered from right sided pleurisy, and on Jan. 16th, 1897, complained of pain in left side, cough, shortness of

* Another patient died a few days after leaving the hospital. His was a tuberculous case.

breath, fever and sweating. Feb. 9th his right pleura was aspirated and one and a half quarts of pus were withdrawn. Feb. 6th, over a slightly bulging area and without anaesthesia, the 9th intercostal space was incised and a metal tube inserted; Feb. 15th tube removed and 1½ inches of 9th rib excised in posterior axillary line to secure better drainage.

Patient succumbed June 4th. Cultures gave streptococci in pure growth. Post-mortem—Ulcerative Pulmonary Tuberculosis; Tubercular Ulceration of Epiglottitis and Intestines; Adhesive Pleuritis of right side; Interstitial Myocarditis.

4. (4454). L. M., æt. 12, was taken ill about Jan. 25th, 1900, with what was regarded as pneumonia of left side. She was ill for four weeks, then she improved for a while. On March 24th it was found that there was tenderness and fulness below the left nipple, her general condition having recently failed.

April 4th, pus was demonstrated by aspirating needle; two days later resection of 8th rib below angle of scapula, gave exit to a large quantity of yellow pus. Some days later, however, the discharge lessened, and on this account it was decided to resect a portion of the 10th rib, thus opening the cavity at its lowest level, April 12th, and a tube was inserted. The patient's condition continued extremely bad; fever, restlessness and dyspnoea characterising it. She succumbed on April 19th to a double empyema. Bacteria, streptococci.

Post-mortem—Bilateral empyema, numerous pockets of pus; collapse of both lungs. Bronchitis. Some pulmonary interstitial changes.

When we review the tables showing the length of time required to complete the cure of these patients, one naturally asks, whether any better method than those adopted can be devised by which the retracted and adherent lung may be released and allowed to fill the pleural sac. We think *yet earlier* recognition of an empyema is the first step, then a prompt evacuation of the pus seems indicated. Theoretically, the use of the valvular drainage tube that keeps the pleura a closed sac, so far as atmospheric pressure is concerned, appears to one as a means of helping toward greater lung expansion. Nicholas Senn suggests aspirating the chest as a means of securing pulmonary expansion, a day or two before the operation which admits air. Can not something be done in these cases where adhesions are firm and the lung retracted? Perhaps Delorme's operation or some other new operation for breaking down the pleural adhesions and stripping the lung of its contracting fibrous covering, may give more satisfactory results.

The Bacteriology.—Jakowski states that every form of pleural inflammation is of bacterial origin, although one does not always succeed in demonstrating the bacteria in the exudate. Negative results in the examination of pleural effusions are frequent, and especially so in those of the serous or sero-fibrinous form. A. Fraenkel says, in summing up his article on the bacteriological examination of purulent pleural effusion, that when in such an exudate, the microbic examination of a large number of preparations is negative as well as the cultures, one may conclude that the condition in the highest probability is of tuberculous origin.

In our series of thirty cases, examinations of the pleural effusion were made in twenty-three with the following results :—

Micro-organisms.	Frequency.	Pure.	Mixed.
Streptococcus	7	4	{ 3 : i. Staphylococci. ii. Pneumococci. iii. Tubercle Bac.
Diplococcus Pneumoniae.	6	4	{ 2 : i. Streptococci. ii. B. Coli Com. et Staphylococci.
Staphylococcus	6	4	2. Streptococci : Diplococci Pneum.
Bacillus Ramosus	1	1	0
Bacillus Pyocyaneus	1	1	0
Tubercle Bacillus.....	1	0	0
Bacillus Subtilis.....	1	1	1. Streptococci.
Sterile	4	0	0

The two main features as shown by this table, which may be emphasized, are the comparative frequency of staphylococci and the rarity of the diplococcus pneumoniae.

From the clinical history, one is clearly justified in including thirteen of these cases under the class of metapneumonic empyema, although the bacteriological findings do not correspond in every respect. The pleural effusion was examined in eleven instances and in but four was the diplococcus lanceolatus found alone, once it was found with staphylococci and the colon bacillus. In two cases streptococci were present; staphylococci were found in three cases, once alone and twice associated with the colon bacillus; two cultures proved sterile.

The following table presents at a glance the metapneumonic cases with those also in which the pneumococcus lanceolatus was found and where a history of pneumonia was not clear :—

Case Report No.	Age.	Month.	Cultures.	Results.
1526	9	Admitt	ed for persistent sinus	2 years.
1691	9	Sept.	No cultures.	Cured.
1162	5	Dec.	Diplo. Lanceo.	Cured.
2084	20	May	Sterile.	Cured.
2090	8	April	Staphylococci.	Cured.
2205	2	Aug.	Staphylococci et B. Coli.	Cured.
2720	46	Jan.	Diplo. Lanceo.	Cured.
3707	8	July	Sterile.	Cured.
4339	6	Feby.	Strepto. Pyo.	Cured ; Small sinus.
4412	3	Jan.	Diplo. Lanceo.	Cured.
4454	12	Jan.	Streptococci.	Death double empyema.
4661	23	May	Diplo. Lanceo.	Cured.
3571	37	May	{ Diplo. Lanceo. B. Coli Com. Staphy. Aur. and Alb.	Death.
3475	22	March	Diplo. Lanceo. Streptococci.	Discharged ; tube in.

It will be seen from the table that but six cases gave evidence of the presence of the diplococcus lanceolatus, and thirteen are of the metapneumonic type ; clinically, we thus have a positive bacteriological re-

sult in only 45 per cent., supporting the view that the diplococcus pneumoniae was active in producing the empyema.

This view is now well established; the percentage in our cases however falling rather below that of other observers. It may be that as some would account for the sterile cases by the suggestion of the death of the organism of whatever form, so the same suggestion might have equal, if not more, force as applied to the diplococcus lanceolatus.

All cases of pneumococcus infection terminated favorably, with one exception. In this connection it may be well to review the chief points in the history of this case:—

F. N., æt. 27, was taken ill about the 1st of April, 1899, with general pains, thoracic and abdominal, associated with some diarrhoea. A few days later he had cough, blood tinged expectoration and definitely left sided thoracic (axillary) pain, aggravated by cough; he had also some sweating at night.

On April 19th, over two weeks after the onset, he experienced a sharp pain in the right iliac region followed by tenderness and vomiting. The history thereafter until his admission is not recorded.

When admitted on May 22nd, the left chest was aspirated and pus containing the diplococcus lanceolatus was withdrawn; the chest presented a bulging on the left of the 3rd, 4th, 5th and 7th intercostal spaces, with a faint trace of œdema at one part.

Under ether, the patient underwent a double operation for empyema and peritonitis. The appendix was gangrenous at the tip; there was an omental abscess and a considerable amount of pus in the lower part of the abdomen. The pus from the pleural cavity is described as thick with numerous fibrinous masses. The walls of the pleural sac could not be reached by the exploring finger. The pus from the peritoneum contained the bacterium coli; that from the chest at time of operation is reported containing staphylococci.

The history of this case suggests a general infection manifest in general pains, diarrhoea, etc., and a primary localisation at least of that infection in the lungs, with bronchitis, pneumonia of what form we cannot say, and pleurisy of purulent type due to the diplococcus pneumoniae. Upon this followed signs of peritonitis.

Concerning the results found in the bacteriological examinations made in these cases, it may be said that some doubt must remain as to the exact relationship which the bacteria bear to the production of pus. This applies especially to the forms of, staphylococci, the bacillus coli com. and the bacillus pyocyaneus, ramosus and subtilis.

We have in this series but three cases occurring in tuberculous patients, i.e., patients in whom tuberculosis is undoubted. In one of these the cultures showed pure streptococcus growth, no tubercle bacilli were found in the pleural effusion. The others were the subjects of pneumothorax with shrunken and intimately adherent lung.

The examinations for tubercle bacilli were positive in one case on two occasions by two observers, while in the other there is no record of a test having been made. While it is rare to find tubercle bacilli in cases

of empyemata in tuberculous subjects, yet where a pneumothorax exists one can readily understand how much more likely one would be to secure a positive result in examinations for that organism. We may note in passing, too, that among these cases there is one which shows how an empyema in tuberculosis may originate in a pure streptococcus infection.

In the four cases of purulent pleurisy, staphylococci were found alone. In one of these one need not wish for a more typical history of lobar pneumonia than is to be found in this case. There was crisis on the 9th day and after two or three days the temperature rose, and for five weeks ran a septic course. It is recorded that in the act of exploring, air escaped; yet at the time of resection of the rib some days later no evidence of pneumothorax was detected.

The rôle played by this micro-organism in the cause of empyema is yet very uncertain. Fowler considers it as still doubtful whether it should be regarded as a causative agent, and Netter remarks upon the rarity of its being found alone. That it may render purulent a serous or sero-fibrinous fluid is admitted, and the recent cases recorded by Lop and Montoux confirm this teaching.

Many regard an infection with staphylococci as far more common in tuberculous patients. Yet in reviewing the histories of these patients so infected, but little if any evidence is forthcoming to show that these were tuberculous subjects.

The bacillus ramosus and the bacillus pyocyaneus were found in one case where some weeks before about eighty ounces of clear fluid had been withdrawn. In this case a sinus persisted and fluid discharged along the track of the exploratory needle.

The bacillus subtilis was found in one case. The patient's chest had been aspirated under very unfavourable circumstances to relieve the urgent dyspnoea some days before the rib was excised.

To Dr. James Bell and Dr. Garrow, under whose care these cases finally came, I am greatly indebted for the privilege of making this study, and also to the members of the Resident Medical Staff who have so kindly assisted in making the analysis of the reports.